EXAMINING HYPERMETALLIC OXIDE MgOMg WITH LASER INDUCED FLUORESCENCE AND PHOTOIONIZATION SPECTROSCOPY

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Despite the fact that diatomic alkaline earth monoxides are deeply bound, closed shell molecules, hypermetallic species of the form MOM are also found to be stable. Formally these molecules have ionic bonds of the form $M^+O^{2-}M^+$. Each M^+ ion hosts an unpaired electron, and the interactions between these well separated electrons are weak. As a consequence the singlet-triplet energy interval is small, and the lowest energy singlet state is strongly multi-reference in character. In the present study we have characterized MgOMg by means of laser induced fluorescence and resonance enhanced multi-photon ionization (REMPI) spectroscopy. Rotationally resolved electronic spectra have been recorded for multiple bands of the $A^1A_1 - X^1\Sigma_g^+$ transition in the range of 21500 – 23000 cm^{-1}. The spectra were consistent with bent and linear equilibrium structures for the excited and ground states. Fluorescence decay lifetimes were found to be 39$\pm$1 ns. The attribution of the observed excitation bands to MgOMg was confirmed by recording REMPI spectra with mass-resolved ion detection. Two-color ionization measurements defined an ionization energy of 53071(20) cm^{-1}, close to a computational prediction of 53330 cm^{-1}.